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August 2002

Proposed Plan for the Blackbird Mine Site:
Lemhi County, Idaho

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan identifies the Preferred Alternative for addressing contaminated surface water, groundwater, sediments and soils/tailings deposited along the banks of creeks (overbank deposits) from the Blackbird Mine Site (Site) and provides the rationale for the preferred alternative. This Proposed Plan also includes summaries of other alternatives evaluated for the Site. This document is issued by the Environmental Protection Agency (EPA). EPA will select a final remedy for the Site after reviewing and considering all information submitted during the 30-day public comment period. EPA may modify the Preferred Alternative or select another alternative presented in the Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all alternatives presented in the Proposed Plan. The cleanup of the Site is being conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) also known as Superfund.

EPA Invites Public Comment on a Proposed Cleanup Plan for the Blackbird Mine Site

Public Comment Period: August 12 to September 10, 2002

The U.S. Environmental Protection Agency invites your comments either in writing or by providing oral comments to a court reporter at a public meeting on August 26, 2002. Written comments need to be postmarked before or on September 10, 2002 and sent to:

Fran Allans
US EPA - Idaho Operations Office
1435 North Orchard
Boise, ID 83706

PUBLIC MEETING

To Discuss Cleanup Alternatives and Receive Public Comment on the Proposed Plan.

Date: **August 26, 2002**

Time: **6:30-8:30pm**

Location: **Panther Creek Inn on Panther Creek Road**

If you need directions to the meeting, please call:
Pete Peters, U.S. Forest Service, at (208) 879-4158
or Fran Allans, EPA Project Manager, at (208) 378-5775.

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Because hazardous substances will remain on site, long-term operations and maintenance (O&M) and five-year reviews will be required.

EPA is issuing this Proposed Plan as part of the public participation responsibilities under Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This Proposed Plan summarizes information that can be found in greater detail in the Remedial Investigation and Feasibility Study Reports (RI/FS) and other documents contained in the Administrative Record file for this Site.

The Administrative Record file for this Site is located at the locations provided at the end of the Proposed Plan. The Administrative Record may be supplemented during the public comment period with additional information.

EPA encourages the public to review these documents to gain a more comprehensive understanding of the site and Superfund activities that have been conducted at the Site.

The State of Idaho, the Federal Natural Resource Trustees [U.S. Forest Service, National Oceanic Atmospheric Association (NOAA) and the National Marine Fisheries Service (NMFS)] and Nez Perce and Shoshone-Bannock Tribes have been consulted during the RI/FS process.

SITE BACKGROUND

The Blackbird Mine site is an inactive mine located in Lemhi County, Idaho, approximately 13 miles south of the Salmon River and twenty five miles west of Salmon, Idaho. The Blackbird Mine Site spans two drainages: Bucktail Creek and Meadow/Blackbird Creek. These drainages flow into Panther Creek which flows into the main stem of the Salmon River (*See Figure 1*). The Blackbird Mine consists of approximately 830 acres of patented private mining claims, and is situated within 10,000 acres of currently and previously held unpatented mining claims in the Cobalt Ranger District of the Salmon-Challis National Forest.

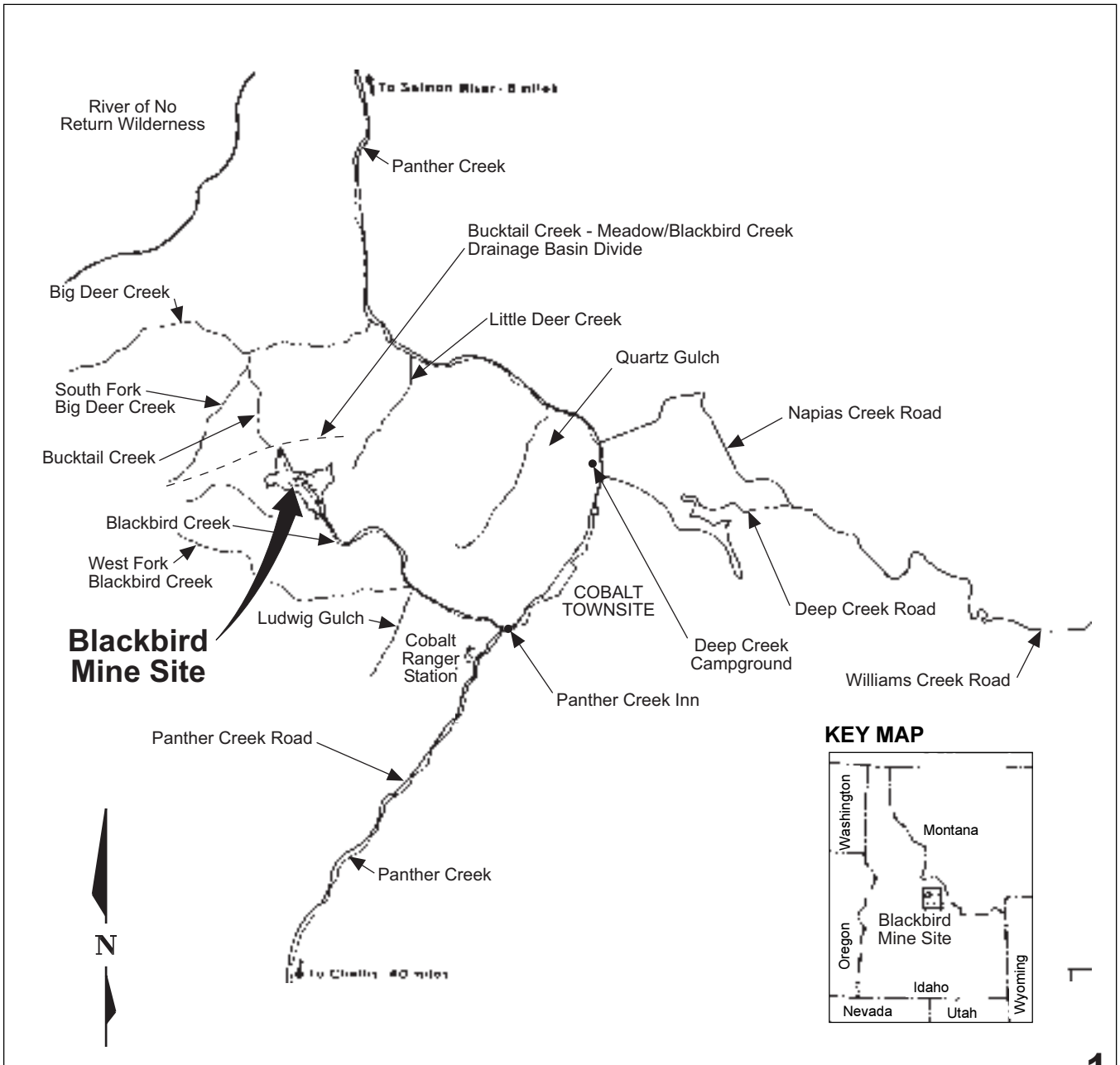

FIGURE 1
REGIONAL OVERVIEW MAP
BMSG/BLACKBIRD MINE SITE/ID

SOURCE: ERT 1982

DRAWING NO. 94315950039200fg05.fh9 DATE 08/05/02 DRAWN BY EL

Golder Associates

Mining operations at this Site began in the early 1900s with the most extensive period of extraction and production from 1949 to 1967. The extraction of gold, cobalt and copper ore from both underground and open pit mining operations resulted in approximately 12 acres of unreclaimed open pit, at least 14 miles of underground workings, approximately 4.8 million tons of waste rock, and 2 million tons of mill tailings disposed in the West Fork Tailings Impoundment.

A number of cleanup actions (Early Actions) were performed between 1993 and 2001 prior to this Proposed Plan for final remediation. These actions have primarily focused on collecting contaminated water running off of sources (mainly waste rock) in the mine area for treatment of copper and cobalt at a water treatment plant, stabilizing waste rock piles and the West Fork Tailings Impoundment and removing soil contaminated with arsenic along the banks of Blackbird Creek and Panther Creek. The source control actions were performed by the potentially responsible parties (PRPs) under EPA oversight and were comprised of the following:

Meadow/Blackbird Creek Drainage Basin: Construction of water diversion ditches and pipelines to separate clean water from contaminated water, collection of contaminated water behind a dam, upgrading the water treatment plant, relocation and covering of waste rock piles, a groundwater cutoff wall, removal of visually obvious erodible tailings from the banks along Blackbird Creek and a new channel and spillway for West Fork of Blackbird Creek at the West Fork Tailings Impoundment.

Bucktail Creek Drainage Basin: Construction of water diversion ditches and pipelines to separate clean water from contaminated water, collection of contaminated water behind a dam, a new adit to transport contaminated water to the upgraded water treatment plant, relocation of waste rock piles, temporary sediment control dams, sediment control basins and ditches, debris flow traps, relocation of a portion of debris flow material from along Bucktail Creek, and use of the Blacktail Pit as a repository for relocated waste rock and debris flow material.

Panther Creek Drainage Basin: Removal of contaminated soils along the banks of Panther Creek at several private properties and on lands administered by the National Forest Service that showed an unacceptable risk to humans under current use scenarios.

SITE CHARACTERISTICS

The Blackbird Mine includes one of North America's largest cobalt deposits. The mine is within the Blackbird and Bucktail Creek drainages, both of which ultimately flow into Panther Creek. (*See Figure 1.)*

Waste rock is a result of the historic mining activities, and has been the largest source of contamination to surface water and groundwater at the Blackbird Mine Site. Acid rock drainage from the waste rock piles, the underground workings, the Blacktail Pit, tailings deposited along Blackbird Creek and the West Fork Tailings Impoundment have resulted in the release of elevated levels of hazardous substances to the environment (groundwater, surface water, soils), including but not limited to copper, cobalt and arsenic. These releases have contributed to elevated levels of dissolved copper and cobalt in Panther Creek and its tributaries and arsenic in soil along the banks of Blackbird Creek and Panther Creek. The fisheries and aquatic resources downstream of the Blackbird Mine have been impacted by arsenic, copper and cobalt releases. Dissolved copper concentrations in Panther Creek, Big Deer Creek and it's tributaries continue to frequently exceed the copper federal ambient water quality criteria and State of Idaho water quality standard for protection of aquatic life and exceed risk based levels for cobalt in some creeks even after completion of the Early Actions.

The snake river spring/summer chinook salmon, steelhead trout, bull trout, gray wolf, canada lynx and bald eagle occur in the area and are listed as threatened or endangered under the Endangered Species Act.

SCOPE AND ROLE OF RESPONSE ACTION

The action in this Proposed Plan is considered the final cleanup action for the Site. The final Remedial Action will address the remainder of the concerns related to contaminated runoff from waste rock piles, water leaching from the West Fork Tailings Impoundment and contaminated soil along creeks that were not previously addressed under the Early Actions.

SUMMARY OF SITE RISKS

As part of the RI/FS process, EPA conducted a baseline risk assessment to determine the current and future effects of contaminants on human health and the environment. It is EPA's judgement that the Preferred Alternative identified in the Proposed Plan, is necessary to protect public health or welfare or the environment from actual of threatened releases of hazardous substances into the environment.

Human Health Risks

A human health risk assessment (HHRA) was prepared to evaluate potential risks to humans for areas that were not addressed by the Early Actions. The HHRA evaluated the potential for adverse health effects for persons who may come into contact with contaminated surface soil, waste rock, tailings, sediment or surface water if no further cleanup is performed.

Risks were evaluated for exposure to contaminated media for workers, trespassers and/or recreational users under current and likely future conditions. The potential contaminants of concern that were evaluated in the risk assessment were: arsenic, cobalt, copper, iron and manganese. The results of this risk assessment indicate that the potential risks associated with exposure to contaminated surface soil, mine wastes, surface water, groundwater and in-stream sediment, do not exceed EPA's acceptable risk range for carcinogenic (cancer causing) effects or for non-carcinogenic effects for most of the Site with the following exceptions:

- Small localized areas of soil along the banks of Blackbird Creek (*i.e.*, overbank soil/deposits) with elevated arsenic concentrations that may present unacceptable acute (short-term) or chronic (long-term) risks during recreational use.
- Instream sediments and soil along the bank of Blackbird Creek adjacent to the Panther Creek Inn (PCI) downstream from where Panther Creek road crosses Blackbird Creek show a potential risk to the residents who live at the Inn.
- Removal of contaminated soil deposited along the banks of Panther Creek was performed as Early Actions at areas that posed a potential risk under current use conditions. Areas that posed a potential risk under a future use scenario were deferred to the final remedial action. Potential risks for three private properties (Rogers, former Strawn/Bowman, and Rufe) along Panther Creek exceed EPA's acceptable risk range for a hypothetical future residential use scenario. Based on limited data there were also risk estimates that exceed EPA's acceptable range for the residential exposure scenario for the Hade property.

Ecological Risks

Aquatic

An aquatic ecological risk assessment was performed which evaluated risks to the aquatic ecosystems of Blackbird Creek, Bucktail Creek, South Fork of Big Deer Creek, Big Deer Creek and Panther Creek. The potential chemicals of concern for aquatic life include arsenic, cobalt, copper, manganese, nickel and zinc. The receptors of concern are resident forage fish and salmonids, anadromous salmonids and benthic invertebrates. The potential risks to aquatic life were predicted using Hazard Quotients (HQ). An HQ in excess of 1 indicates a potential for risk, whereas an HQ below 1 indicates little potential for adverse effects. The results of the risk assessment showed that copper and cobalt in surface water and copper, cobalt and arsenic in sediment resulted in HQs greater than 1 and showed a potential risk to aquatic life in all the area creeks.

Terrestrial

A terrestrial ecological risk assessment was conducted to determine the risk to populations of receptors of concern (deer mice, shrews, ground squirrels and robins) from mine-related deposits within the riparian zones of Blackbird Creek, Panther Creek, Bucktail Creek, South Fork Big Deer Creek and Big Deer Creek. Potential risks from exposures within waste rock piles and tailing impoundment areas were also evaluated. The potential contaminants of concern that were evaluated for terrestrial receptors included arsenic, copper and cobalt. The results of the risk assessment showed that there were no significant risks to terrestrial receptors.

Based on the above summary of risks to human health and aquatic life EPA determined that additional remedial actions at the Blackbird Mine Site are warranted.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) provide a general description of what the cleanup action will accomplish. The RAOs for this site are provided in the following table:

Table 1. Remedial Action Objectives for Blackbird Site

Media	Receptors of Concern	Remedial Action Objectives
Surface Soils/ Overbank Deposits	Human Receptors	Reduce direct contact (*i.e.*, ingestion and dermal contact) with surface soils containing contaminants of concern in excess of the cleanup levels. Reduce the migration of surface soils and overbank deposits to downstream areas that would deposit concentrations of contaminants of concern in excess of the cleanup levels established at those downstream areas.
	Aquatic Receptors	Reduce migration of metals into the water column of the streams so that the cleanup levels for the contaminants of concern established for the streams are not exceeded. Reduce migration of the surface soils to instream sediments so that the cleanup levels for the contaminants of concern established for instream sediments are not exceeded.
Instream Sediments	Human Receptors	Reduce direct contact with instream sediments containing contaminants of concern in excess of the cleanup levels. Reduce migration of instream sediments to downstream areas that would deposit at concentrations in excess of the cleanup levels for the contaminants of concern established at those downstream areas.
	Aquatic Receptors	Reduce direct contact with instream sediments containing contaminants of concern in excess of the cleanup levels. Reduce migration of instream sediments to downstream areas so that the cleanup levels for the contaminants of concern established for instream sediments at those downstream areas are not exceeded.
Surface Water	Aquatic Receptors	Reduce direct contact with surface water containing contaminants of concern in excess of the cleanup levels.
	Human Receptors	Reduce incidental ingestion of water and ingestion of fish containing contaminants of cancer in excess of the cleanup levels.

Human Health Cleanup Levels for overbank deposits and instream sediments

Blackbird Creek: The proposed action will reduce the risk to humans from exposure to soil in deposits along Blackbird Creek and the erosion of deposits along Blackbird Creek to downstream areas along Panther Creek. The cleanup level for arsenic in upper Blackbird Creek (upstream from the mine gate near the West Fork Tailings Impoundment) is 8,500 parts per million (ppm). For lower Blackbird Creek (from the mine gate to Panther Creek Road) the cleanup level for arsenic is 4,300 ppm. These cleanup levels are based on the human health risk assessement assuming recreational use along Blackbird Creek upstream of Panther Creek road. Soils will also be addressed based on their potential for erosion and migrating downstream.

Due to the proximity to the Panther Creek Inn, the residential use cleanup level of 100 ppm for arsenic is applied to the Blackbird Creek overbank deposits from the bridge at Panther Creek road to the Blackbird/Panther Creek confluence. The cleanup level is based on an evaluation of background concentrations of arsenic in soil. The cleanup level for Blackbird Creek in-stream sediments for residential use in this area is 490 ppm arsenic and is based on site-specific exposure assumptions.

Panther Creek: The cleanup level for arsenic in soil deposited on the private properties along lower Panther Creek is 100 ppm. This cleanup level is for protection of residential use and is based on background concentrations of arsenic in the area.

Aquatic and Human Health Cleanup Levels for Surface Water

For the purposes of the RI/FS, EPA has been utilizing the Idaho Water Quality Standards (WQS) as the cleanup goals for surface water quality for copper and arsenic. However, Section 121(d)(2)(A) of CERCLA, 42 U.S.C. 9621(d)(2)(A), provides that remedial actions "shall require a level or standard of control which at least attains water quality criteria estalished under section 303 or 304 of the Clean Water Act where such goals or criteria relevant and appropriate under the circumstances of the release or threatened release." To satisfy this requirement, EPA is considering utilizing the Federal Aquatic Water Quality Criteria (AWQC) to establih cleanup goals for copper and arsenic in surface water. Although these cleanup goals are more stringent than the Idaho WQS, the alternatives presented in this Proposed Plan remain appropriate for this site. However, the achievement of the Federal AWQC for copper and arsenic is expected to take longer to achieve and may require additional contingent actions. The Federal AWQC will be used as the cleanup goal for copper and arsenic unless it is determined not to be relevant and appropriate based on the circumstance of the release, the designated beneficial use, the environmental media affected, the purposes for which the criteria were developed or the latest information available as set forth in Section 121(d)(2)(B)(i) of CERCLA, 42 U.S.C. 9621(d)(2)(B)(i). EPA is evaluating the latest information on arsenic in surface which may affect the cleanup level.

The cobalt cleanup level in surface water and sediment cleanup levels are based on the Aquatic Ecological Risk Assessment.

For Blackbird Creek, EPA has established a non-numeric narrative cleanup goal instead of a numeric cleanup level. During the Feasibility Study, it became apparent that the alternatives for Blackbird Creek would not achieve the initial water quality cleanup goals for aquatic life established for Blackbird Creek. The State of Idaho removed the beneficial use designation for aquatic life. Therefore, the cleanup levels for protection of aquatic life are not applicable to this creek. However, the water quality in Blackbird Creek must achieve cleanup levels that are protective for secondary contact recreation for humans which is .050 mg/l arsenic. In addition, improvements in water quality to support additional aquatic life within Blackbird Creek will be required.

The remedial goal for Blackbird Creek is to improve water and sediment quality such that cleanup levels are not exceeded downstream in Panther Creek. In addition, the remedial goal for Blackbird Creek is to support aquatic life at levels similar to that of nearby reference streams, although not necessarily to support salmonids or metals-sensitive macro-invertebrate taxa.

A similar situation exists for Bucktail Creek where the State of Idaho has performed an use attainability analysis for Bucktail Creek which removed the beneficial use designations for aquatic life and recreation from this segment. As noted in the use attainability analysis, Bucktail Creek is too small to have any real likelihood of contact recreation such as wading, fishing, and swimming. Physical conditions related to the natural features of Bucktail Creek, such as steep gradient and small size and flow, likely precluded its pre-mining use by fish. In addition, limited habitat conditions result in minimum potential for significant contribution of benthic invertebrates to the overall food supply in the Big Deer Creek drainage. Since there are no designated beneficial use for Bucktail Creek, the cleanup levels for protection of aquatic lifer are not applicable to this creek,

Table 2. Summary of Sediment and Surface Water Aquatic Life Cleanup Levels by Drainage

Drainage	Media	Arsenic	Cobalt	Copper
Panther Creek	Instream Sediments	35 mg/kg	80 mg/kg	149 mg/kg
	Surface Water	AWQC	0.038 mg/l	AWQC
South Fork of Big Deer Creek	Instream Sediments	35 mg/kg	436 mg/kg	637 mg/kg
	Surface Water	AWQC	0.038 mg/l	AWQC
Big Deer Creek	Instream Sediments	35 mg/kg	80 mg/kg	149 mg/kg
	Surface Water	AWQC	0.038 mg/l	AWQC

See the Remedial Objective/Prelimimary Remediation Goals Technical Memorandum and addendum to the technical memorandum in the Administrative Record for more information on the human health and aquatic cleanup levels.

SUMMARY AND EVALUATION OF ALTERNATIVES

Several technologies and alternatives were considered for cleaning up the Blackbird Mine site. The preferred alternatives for the Blackbird Mine site were selected on the basis of evaluating each alternative against the first seven of the nine evaluation criteria required by the NCP. These criteria are shown in Table 4. The nine criteria are divided into three categories: threshold, balancing, and modifying criteria.

To be eligible for selection, an alternative must meet the two threshold criteria: overall protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs). To be protective of human health, the alternative must meet the identified cleanup level for arsenic in soil. To be protective of the environment, the alternative must meet the identified cleanup level for cobalt and copper in surface water and sediments. Compliance with Applicable or Relevant and Appropriate Regulations (ARARs) invokes a number of regulatory requirements.

The five balancing criteria weigh tradeoffs among alternatives. The balancing criteria are (1) long-term effectiveness and permanence; (2) reduction of toxicity, mobility or volume through treatment or recycling; (3) short-term effectiveness; (4) implementability and (5) cost.

The two modifying criteria State and community acceptance are generally considered after the public comment period during selection of the final remedy.

Table 3 - NCP Criteria for Evaluation of Alternatives.

THRESHOLD CRITERIA: Must be met by all alternatives to be selected by EPA

1. Overall protection of human health and the environment. How well does the alternative protect human health and environment, both during and after construction?
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs). Does the alternative meet all applicable or relevant and appropriate state and federal laws and regulations?

BALANCING CRITERIA: Used to compare alternatives.

3. Long-term effectiveness and permanence. How well does the alternative protect human health and the environment after completion of cleanup? What, if any, risks will remain at the site?
4. Reduction of toxicity, mobility or volume through treatment or recycling. Does the alternative effectively treat the contamination to significantly reduce the toxicity, mobility and volume of the hazardous substances?
5. Short-term effectiveness. Are there potential adverse effect to either human health or the environment during construction or implementation of the alternative?
6. Implementability. Is the alternative both technically and administratively feasible? Has the technology been used successfully at similar sites?
7. Cost. What are the relative costs of the alternative? Total present worth costs are based upon a 7 percent discount rate for 30 years.

MODIFYING CRITERIA: Evaluated as a result of public comments.

8. State acceptance. What are the state's comments or concerns about the alternatives considered and about the preferred alternative? Does the state support or oppose the preferred alternative?
9. Community acceptance. What are the community's comments or concerns about the alternatives considered and the preferred alternative? Does the community generally support or oppose the preferred alternative?

Because the Blackbird Mine affects three different drainages, the alternatives for the Blackbird Mine Site have been divided into the following remediation areas:

- Blackbird Creek (this area includes sources and affected surface water, groundwater, overbank deposits and instream sediments in Meadow Creek, Blackbird Creek and the West Fork Tailings Impoundment;
- Bucktail Creek (this area includes sources and affected surface water, groundwater, and instream sediments in Bucktail Creek, South Fork of Big Deer and Big Deer Creek);
- Panther Creek (this area includes overbank deposits on Panther Creek and instream sediments in Panther Creek).

The Blackbird Creek and Bucktail Creek alternatives address sources that affect water quality and sediments in tributaries in their respective drainages as well as water quality and sediments downstream in Panther Creek

The remedial alternatives for the site are presented below. The costs for all alternatives are listed under each alternative. The alternatives are numbered to correspond with the numbers in the Feasibility Study (FS) Report. The numbers are not sequential because they are the alternatives that were carried forward to the detailed analysis and the other alternatives were screened out earlier in the FS report.

Blackbird Creek Drainage Alternatives

Common Elements for Blackbird Creek Alternatives:

The following elements are included in all of the Blackbird Creek drainage alternatives except the No Further Action alternative.

- Institutional controls (ICs) will be required for all alternatives except No Further Action. ICs are administrative measures such as easements, restrictive covenants and enforcement tools. The ICs would require operation, maintenance and monitoring of the remedy and would preclude activities at the mine site that would interfere with the remedy.
- Continued operation of the existing lime precipitation and air oxidation water treatment plant to treat copper and cobalt in water collected by the Early Actions and for treatment of additional contaminated water collected as part of the Remedial Actions.
- Removal of overbank deposits along Blackbird Creek and instream sediments adjacent to the PCI that are above cleanup levels. The area would be periodically monitored to determine if it has become recontaminated, and additional removal conducted if future monitoring determines that there is an unacceptable risk to human health.
- Meadow Creek seep collection includes revising the drainage systems in upper Meadow Creek to collect contaminated water and treat the water that was not intercepted as part of the Early Actions at the existing water treatment plant. The contaminated water will be collected behind the 7100 dam and clean water will be diverted around the dam by pipes and a ditch.
- Soil cover on the West Fork Tailings Impoundment. The cover material will consist of soil that was removed from the overbank of Blackbird Creek and Panther Creek during the Early Actions and any overbank deposits removed from Blackbird Creek and Panther Creek during the Remedial Actions. The cover will be graded to drain to the creek channel, and will be seeded to establish vegetation. The cover will reduce the amount of cobalt that leaches from the impoundment into groundwater and downstream surface water.
- Monitoring and maintenance of existing and proposed facilities. In addition, periodic monitoring of surface water, sediments, benthic macroinvertebrates, fish, as well as sampling of overbank deposits of Panther Creek (downstream from Blackbird Creek) following significant runoff events.
- Natural recovery of instream sediments includes a variety of natural, physical,

chemical and biological processes that result in the concentration of contaminants in sediments being reduced over time without taking active measures (such as dredging) to achieve cleanup levels in sediments. For example, metal concentrations are reduced by metals dissolving back to the water column, and by physical sediment transport from scouring and mobilization of fine-grained sediments until concentrations in sediments are reduced to cleanup levels. It is not possible to accurately predict how long it will take for natural recovery of instream sediments.

- Five year reviews to evaluate the effectiveness of the cleanup actions.
- The cleanup level for arsenic in surface water is under evaluation by EPA. Therefore, the time to achieve the arsenic cleanup level in surface water is uncertain.

Alternative BB-1 - No Further Action

Under this alternative no further actions would be implemented, other than the Early Actions that already have been completed. Monitoring as described under common elements, and operation and maintenance of the existing Early Action facilities would continue.

Estimated Capital Cost: $0

Estimated Operations and Maintenance (O&M) Cost: $1.3 Million

Estimated Present Worth Cost: $1.3 Million

Estimated Construction Time: None, O&M of existing Early Action facilities will be for perpetuity.

Estimated Time to Achieve RAOs: Will not achieve RAOs.

Alternative BB-4 – Meadow Creek Seep Collection; Cover West Fork Tailings Impoundment; Stabilization with Selective Removal of Overbank Deposits; Natural Recovery for In-Stream Sediments

This alternative contains all the elements that are described above under the common elements. However, this alternative also includes physical stabilization of overbank deposits by armoring with rock and limited removal of overbank deposits along Blackbird Creek. The overbank deposits that are removed will be used in the cover at the West Fork Tailings Impoundment.

Estimated Capital Cost: $2.1 Million

Estimated Operations and Maintenance Cost: $2.1 Mil

Estimated Total Present Worth Cost: $4.2 Mil

Estimated Construction Time Frame: 1 to 2 years

Estimated Time to Achieve RAOs: 1 year after construction under certain flow conditions but not likely all of the year for water quality. Blackbird Creek sediment recovery is uncertain.

Alternative BB-5 – Meadow Creek Seep Collection; Cover West Fork Tailings Impoundment and Treat Tailings Impoundment Seepage; Stabilization with Selective Removal of Overbank Deposits; Natural Recovery for In-Stream Sediments

This alternative contains all the elements that are described above under the common elements. However, this alternative includes physical stabilization by armoring with rock and limited removal of overbank deposits along Blackbird Creek as in Alternative BB-4 plus collection and treatment of cobalt in groundwater seepage from the West Fork Tailings Impoundment. Three options are considered for treating cobalt in the water from the impoundment. The options are to: pump the water to the existing water treatment plant; *ex-situ* treatment by installing a pre-designed (packaged) water treatment plant (ex. lime precipitation); or *in-situ* passive treatment which could be accomplished in a variety of ways including a sorption cell, an apatite treatment bed, anaerobic sulfate-reducing bacterial (SRB) cell, or a pH increasing process. Treatability studies will be performed for both the *in-situ* treatment option and the *ex-situ* pre-designed water treatment plant option. Based on the treatability studies, EPA will select the best treatment option based on effectiveness and cost.

Estimated Capital Cost: $3.2 Mil (passive), $4.6 Mil (*ex-situ*, pre-designed), $5.3 Mil (*ex-situ* pump-back to existing water treatment plant)

Estimated Operations and Maintenance Cost: $3.3 Mil (passive), $4.9 Mil (*ex-situ*, pre-designed), $4.6 Mil (*ex-situ* pump-back to existing water treatment plant)

Estimated Total Present Worth Cost: $6.5 Mil (passive), $9.5 Mil (*ex-situ*, pre-designed), $9.9 Mil (*ex-situ* pump back to existing water treatment plant).

Estimated Construction Time Frame: 2 years

Estimated Time to Achieve RAOs: 1 year after construction under certain flow conditions but not likely all of the year for water quality. Blackbird Creek sediment recovery is uncertain.

Alternative BB-6 – Meadow Creek Seep Collection; Cover West Fork Tailings Impoundment; Removal with Selective Stabilization of Overbank Deposits; Natural Recovery for In-Stream Sediments

This alternative contains all the elements that are described above under the common elements. However, this alternative consists of primarily removing overbank deposits along Blackbird Creek with limited physical stabilization by armoring with rocks. The removal of overbank deposits would reduce the amount of copper and cobalt leaching into Blackbird and Panther Creek more than Alternative BB-4 which primarily leaves the contaminated overbank deposits in place with stabilization. The deposits that are removed will be used in the cover at the West Fork Tailings Impoundment.

Estimated Capital Cost: $2.7 Mil

Estimated Operations and Maintenance Cost: $1.9 Mil

Estimated Total Present Worth Cost: $4.6 Mil

Estimated Construction Time Frame: 1 to 2 years

Estimated Time to Achieve RAOs: 1 year after construction under certain flow conditions but not likely all of the year for water quality. Blackbird Creek sediment recovery is uncertain.

Alternative BB-7 – Meadow Creek Seep Collection; Cover West Fork Tailings Impoundment and Treat Tailings Impoundment Seepage; Removal with Selective Stabilization of Overbank Deposits; Natural Recovery for In-Stream Sediments (EPA's Preferred Alternative)

This alternative contains all the elements that are described above under the common elements. However, this alternative consists of primarily removing overbank deposits along Blackbird Creek with limited physical stabilization by armoring with rocks as in Alternative BB-6 plus collection and treatment of cobalt in water from the West Fork Tailings Impoundment as described under Alternative BB-5.

Estimated Capital Cost: $3.7 Mil (passive), $5.2 Mil (*ex-situ*, pre-designed), $5.8 Mil (*ex-situ* pump-back to existing water treatment plant)

Estimated Operations and Maintenance Cost: $3.1 Mil (passive), $4.7 Mil (*ex-situ*, pre-designed), $4.4 Mil (*ex-situ* pump-back to existing water treatment plant)

Estimated Total Present Worth Cost: $6.8 Mil (passive), $9.9 Mil (*ex-situ*, pre-designed), $10.3 Mil (*ex-situ* pump back to existing water treatment plant).

Estimated Construction Time Frame: 2 years

Estimated Time to Achieve RAOs: 1 year after construction for water quality, Blackbird Creek sediment recovery is uncertain.

Alternative BB-8 – Meadow Creek Seep Collection; Cover West Fork Tailings Impoundment and Treat Tailings Impoundment Seepage; Complete Removal of Overbank Deposits and In-Stream Sediments

This alternative contains all the elements that are described above under the common elements and includes treatment at the West Fork Tailings Impoundment as described under Alternative BB-5. However, this alternative differs from the other Blackbird Creek alternatives in that it includes complete removal of both overbank deposits and in-stream sediments in Blackbird Creek. Removal would extend from the existing road to the valley wall across from the road. Because separation of natural and mine-related in-stream sediments is not practical, all sediments in the stream channel would be removed to bedrock (including sediments below the water table). Following excavation, sufficient backfill would be placed in and around the stream channels to provide riparian habitat, and the backfill would be revegetated.

Estimated Capital Cost: $49.1 Mil (passive), $50.5 Mil (*ex-situ*, pre-designed), $51.2 Mil (*ex-situ* pump-back to existing water treatment plant)

Estimated Operations and Maintenance Cost: $3.7 Mil (passive), $5.4 Mil (*ex-situ*, pre-designed), $5.1 Mil (*ex-situ* pump-back to existing water treatment plant)

Estimated Total Present Worth Cost: $52.8 Mil (passive), $55.9 Mil (*ex-situ*, pre-designed), $56.2 Mil (*ex-situ* pump back to existing water treatment plant).

Estimated Construction Time Frame: 2 years

Estimated Time to Achieve RAOs: 1 year after construction for water quality, Blackbird Creek sediment recovery is uncertain.

Comparative Analysis of Blackbird Creek Drainage Alternatives:

Overall Protection of Human Health and the Environment. Alternative BB-1 (the No-Further Action alternative) would not prevent direct contact with Blackbird Creek overbank deposits containing arsenic concentrations above the human health cleanup levels and therefore would not be considered protective of human health. Alternatives BB-4 through BB-8 would all reduce direct contact with the Blackbird Creek overbank deposits through removal and/or stabilization. In addition, alternatives BB-4 through BB-8 would reduce deposition downstream along Panther Creek at concentrations exceeding the arsenic cleanup levels. Thus, EPA has determined that alternatives BB-4 through BB-8 would be protective of human health.

Alternatives BB-1, BB-4 and BB-5 are not predicted to consistently meet the copper nor cobalt water quality cleanup levels in Panther Creek nor narrative cleanup goals for Blackbird Creek. Therefore, it is less certain whether these alternatives will achieve cleanup levels. Alternative BB-6 is predicted to consistently meet the copper water quality cleanup level in Panther Creek and narrative goals in Blackbird Creek. However, there is considerable uncertainty concerning whether Alternative BB-6 can meet the cobalt cleanup level in Panther Creek in a reasonable time period. Alternative BB-7 and BB-8 would consistently meet the copper and cobalt water quality cleanup levels in Panther Creek and narrative goals in Blackbird Creek in a reasonable time period and provide the greatest degree of certainty that cleanup levels in Panther Creek will be achieved. Under Alternative BB-7, Panther Creek sediments would eventually meet cleanup levels through natural recovery in several years to potentially decades. Alternative BB-8 would meet cleanup narrative goals in Blackbird Creek sediments and possibly water quality more quickly but does not provide any benefit over BB-7 in achieving Panther Creek cleanup levels. BB-8 would result in extensive disruption of the stream channel and habitat along Blackbird Creek that would take years to recover. EPA has therefore determined that Alternative BB-7 and BB-8 would be protective of the environment in Panther Creek.

Compliance with ARARs. The copper water quality ARAR for Panther Creek is not predicted to be consistently met by Alternatives BB-1, BB-4 and BB-5, especially during spring runoff. Alternatives BB-6, BB-7 and BB-8 are predicted to consistently meet the copper water quality ARAR in Panther Creek throughout the year. To meet the National Pollution Discharge Elimination System (NPDES) permit requirements for the water treatment plant and West Fork Tailings Impoundment discharges a mixing zone analysis in Panther Creek was performed. The amount of contaminated overbank deposits left in place along Blackbird Creek affects the size of the mixing zone. The mixing zone analysis showed that Alternatives BB-6, BB-7 and BB-8 would result in a similar mixing zone because these alternatives remove more overbank deposits along Blackbird Creek. The mixing zone for these alternatives is smaller than for Alternatives BB-4 and BB-5 which stabilize more of the overbank deposits in place. A smaller mixing zone is preferred. A final determination regarding the acceptability of the mixing zones is pending. Other ARARs (except possibly for arsenic in surface under which is under evaluation) would be met by all alternatives.

Long-Term Effectiveness and Permanence. Human Health – All the alternatives except BB-1 would prevent direct contact with contaminated soils and minimize remobilization of contaminated soils downstream. Removal of most of the overbank deposits (Alternatives BB-6, BB-7 and BB-8) would provide greater reliability and permanence than physical stabilization.

Environment – Alternative BB-1 (No Further Action) would not make any improvements to water quality, and does not provide for for long-term effectiveness. Alternatives BB-4 and BB-5

are rated lower than other alternatives for long term effectiveness. These alternatives leave more contaminated material in place by primarily utilizing stabilization to address Blackbird Creek overbank deposits. The contaminated soils left in place through stabilization leach copper and cobalt to surface water which results in these alternatives being less likely to meet the copper water quality cleanup level during spring runoff. Alternatives BB-6, BB-7 and BB-8 that primarily utilize removal to address Blackbird Creek overbank deposits provide the highest level of effectiveness because they have greater certainty of achieving the copper water quality cleanup level in Panther Creek on a consistent basis. Alternatives BB-6, BB-7 and BB-8 are essentially comparable in terms of copper water quality predictions in Panther Creek; the extensive sediment removals under Alternative BB-8 would provide no noticeable benefit to copper water quality in Panther Creek.

Alternative BB-1 is rated lowest for long-term effectiveness at reducing cobalt concentrations in Panther Creek. Alternatives BB-4 and BB-6 that rely upon the West Fork Tailings Impoundment cover are not predicted to be effective at consistently meeting the cobalt cleanup level in Panther Creek during the periods of highest cobalt concentrations (winter and early spring). Alternatives BB-5, BB-7 and BB-8 that rely upon treatment at the Tailings Impoundment are rated higher for effectiveness because they are predicted to have greater certainty of achieving the cobalt cleanup level in Panther Creek. However, during the periods of highest cobalt concentrations, Alternative BB-5 may not consistently achieve the cobalt cleanup level because more overbank deposits are left in place and stabilized. Alternatives BB-7 and BB-8 provide the highest level of effectivness because they are the only alternatives that are predicted to consistently achieve the cobalt cleanup level in Panther Creek. However, the extensive sediment removals under Alternative BB-8 would provide no discernable benefit to cobalt water quality in Panther Creek.

Sediments are expected to improve through natural recovery under all of the alternatives such that cleanup levels would eventually be achieved in Panther Creek.

Alternative BB-4 has the highest residual risks because it would utilize the cover to address cobalt releases from the impoundment and primarily stabilization through armoring to address overbank deposit risks. Cobalt residual risks from the impoundment are considered more significant than residual risks from overbank deposits. Therefore, Alternatives BB-6 has the next highest residual risk because it utilizes only the cover at the impoundment (which is judged less reliable) to address cobalt releases. BB-5 has less residual risk than BB-6 because it includes treatment for the cobalt releases at the impoundment but would utilize primarily armoring for Blackbird Creek overbank deposits which leaves material in place. Alternative BB-7 has the next highest residual risk since it utilizes treatment to address the cobalt releases and would address the overbank deposit risks primarily through removal. Alternative BB-8 has the least residual risk because it primarily utilizes treatment to address the cobalt releases (which has greater certainty of effectiveness) and would eliminate the overbank deposit risks through complete removal.

All of the alternatives are judged to be comparable in terms of permanence. All of the alternatives depend on proper operation and maintenance of the facilities, ICs and monitoring. As long as the operation and maintenance is properly performed in the future, all of the facilities are considered permanent. However, alternatives BB-6, BB-7 and BB-8 are considered more permanent than other alternatives in addressing the overbank deposits because they utilize primarily removal. Alternative BB-8 is considered the most permanent in addressing overbank deposits but provides no additional environmental benefit for achieving water quality cleanup levels.

Reduction of Toxicity, Mobility and Volume through Treatment. All of the alternatives include treatment of contaminated water at the existing Water Treatment Plant. Alternative BB-1 involves continued operation of the existing WTP at existing flow rates. Alternatives BB-4 and BB-6 add treatment of additional seepage to be collected from Meadow Creek. Alternatives BB-5, BB-7 and BB-8 provide treatment of both Meadow Creek seepage and Tailings Impoundment seepage.

Short-term Effectiveness. Alternative BB-1 is rated highest for short-term effectiveness because it would not result in risks to workers or the community and would have no short-term environmental impacts associated with remedial actions. Alternatives BB-4, BB-5, BB-6 and BB-7 are essentially comparable in terms of risks to the community and workers during construction and short-term environmental risks. Each of these four alternatives could be completed within 1 to 2 years. Alternatives BB-5 and BB-7 that involve treatment to address cobalt would improve water quality much more rapidly than Alternatives BB-4 and BB-6 that rely upon covering the impoundment for cobalt reductions. Alternative BB-8 is rated lowest for short-term effectiveness. This alternative would extensively disturb the stream channel and vegetation requiring a decade or more to re-establish growth. The removal and construction activities would create more short-term risk to the community, site workers and the environment than the other alternatives.

Implementability. Alternative BB-1 is rated highest for technical implementability since no further actions would be required. Alternative BB-6 is rated next highest for technical implementability, since this alternative would not involve design and construction of collection and treatment facilities. Alternative BB-4 is rated next highest because there may be difficulties locating sufficiently-sized armoring materials. Alternative BB-7 is rated next highest for technical implementability because this alternative includes collecting and treating seepage from the Tailings Impoundment which would be more difficult than implementing just the cover. Alternative BB-5 is next highest because it includes collection and treatment of the water from the West Fork Tailings Impoundment, and requires locating armoring materials for Blackbird Creek overbank. Alternative BB-8 is rated lowest for technical implementability because of the extensive excavation and treatment of water at the tailings impoundment. All of the alternatives are rated comparable in terms of implementing institutional controls on lands administered by the Forest Service.

Cost. Alternative BB-7 is the least costly of the alternatives that are protective of human health and the environment by meeting both the copper and cobalt water quality cleanup levels in Panther Creek with certainty and in a reasonable time period. Alternatives BB-4 through BB-6 are less costly than BB-7; however, they are not predicted to meet water quality goals with as much certainty and in a reasonable time period. Alternative BB-8 would not provide any substantial improvements to water quality in Panther Creek compared to Alternative BB-7. Therefore, the substantial difference in costs associated with Alternative BB-8 would not be justified, especially considering the extensive short-term environmental impacts and difficulty in implementing this alternative.

State Acceptance. The State of Idaho has been involved in the development of the Remedial Investigation and Feasibility Study that supports this Proposed Plan. EPA is providing the State of Idaho with an opportunity to comment on the Proposed Plan.

Community Acceptance. Comments received on the Proposed Plan are an important indicator of community acceptance. Com-munity acceptance of the Preferred Alternative will be evaluated after the public comment period ends and will be described in the Record of Decision.

Bucktail Creek Drainage Alternatives

Common Elements for the Bucktail Creek Alternatives:

Institutional controls, monitoring, cleanup level for arsenic in surface water and continued operation of the existing wastewater treatment plant as described under Blackbird Creek alternatives, are common elements for the Bucktail Creek alternatives.

All action alternatives may exceed the AWQC for copper in Big Deer Creek during periods of low hardness which may result in contingent actions in the future.

Alternative BT-1 – No Further Action

Under this alternative, no further actions would be implemented, other than the Early Actions that already have been completed. Monitoring, and operations and maintenance of the existing Early Action facilities would continue.

Estimated Capital Cost: $0
Estimated Operations and Maintenance Cost: $1.3 Mil
Estimated Total Present Worth Cost: $1.3 Mil
Estimated Construction Time Frame: None
Estimated Time to Achieve RAOs: Will not Achieve RAOs.

Alternative BT-3 – Seep Collection and Treatment; Natural Recovery of Sediments

Groundwater seeping into Bucktail Creek below the 7000 dam would be intercepted and pumped back for treatment at the existing water treatment plant or treated at a passive *in-situ* facility (*i.e.*, a sorption wall). The groundwater seep collection system will not be able to intercept all the metals in groundwater. Therefore, the predicted concentrations of metals remaining in Bucktail Creek below the groundwater seep collection system will still be elevated enough to prevent South Fork of Big Deer Creek water quality goals from being met.

Stream sediments in Bucktail Creek, South Fork of Big Deer Creek and Big Deer Creek would be cleaned up by natural recovery. The time required to achieve water quality cleanup levels in Big Deer Creek and South Fork of Big Deer Creek depends on the time for metals to be released from sediments through natural recovery after construction of the groundwater seepage collection system is completed. The metals release from South Fork Big Deer Creek sediments would mostly likely be complete in less than five years. Big Deer Creek sediments are expected to achieve sediment cleanup levels in several years or more. Bucktail Creek sediments at present are not releasing metals to surface water. However, after the groundwater seep collection is completed, the Bucktail Creek sediments could begin to release metals to the surface water. If this happens, the time required for Bucktail Creek sediments to naturally recover to levels that will allow meeting water quality goals in South Fork of Big Deer Creek could be centuries and for Big Deer Creek several years or more. Following construction of the groundwater seep collection, monitoring and further evaluations will be performed to determine if further actions to achieve water quality goals are needed in the future.

Estimated Capital Cost: $2.0 Mil
Estimated Operations and Maintenance Cost: $2.4 Mil
Estimated Total Present Worth Cost: $4.5 Mil
Estimated Construction Time Frame: 2 years
Estimated Time to Achieve RAOs after construction: centuries in South Fork of Big Deer Creek and 2 to 3 years or more in Big Deer Creek for water quality, less than 5 years in South Fork of Big Deer Creek sediments and several years or more in Big Deer Creek sediments.

Alternative BT-4 – Seep Collection and Treatment; South Fork Big Deer Creek Sediment Removal; Natural Recovery of Remaining Sediments

This alternative has groundwater seep collection and treatment as well as natural recovery for Bucktail Creek and Big Deer Creek stream sediments as described under BT-3. However, this alternative includes removal of in-stream sediments in South Fork Big Deer Creek for on-site disposal at the Blacktail Pit.

By removing sediments in the South Fork of Big Deer Creek, copper and cobalt water quality cleanup levels are still not predicted to be met.

The only benefit from removing the South Fork of Big Deer Creek sediments is that the sediment cleanup levels in the creek would be met for only a short period of time. South Fork of Big Deer Creek sediments could become re-contaminated from Bucktail Creek sediments. In addition, there would be short-term impacts from the disruption of riparian habitat.

Estimated Capital Cost: $2.6 Mil

Estimated Operations and Maintenance Cost: $2.4 Mil

Estimated Total Present Worth Cost: $5.1 Mil

Estimated Construction Time Frame: 2 to 3 years

Estimated Time to Achieve RAOs after construction: centuries in South Fork of Big Deer Creek and 2 to 3 years or more in Big Deer Creek water quality, 5 years or less in South Fork of Big Deer sediments, and several years or more in Big Deer Creek sediments.

Alternative BT-5 – Seep Collection and Treatment; Diversion of Bucktail Creek; Natural Recovery of Sediments (EPA's Preferred Alternative)

This alternative has groundwater seep collection and treatment as well as natural recovery for stream sediments as described under BT-3. Water quality goals in both South Fork of Big Deer and Big Deer Creeks could be met with this alternative. This alternative includes diverting Bucktail Creek in a pipeline or ditch around South Fork Big Deer Creek to discharge directly into Big Deer Creek. As described under BT-3, the groundwater seep collection will not intercept all of the ground-water and Bucktail Creek will still have elevated metals.

Diverting Bucktail Creek surface water around South Fork of Big Deer Creek would decrease metals entering South Fork of Big Deer Creek to a level that water quality cleanup levels would be expected to be met in South Fork of Big Deer Creek (after natural recovery of sediments). Since South Fork of Big Deer Creek would no longer receive metals from Bucktail Creek, the natural recovery process for the sediments should be accelerated, such that the sediment cleanup levels would likely be met sooner in South Fork of Big Deer Creek sooner (estimated to be 2 to 5 years). The amount of time it would take for Big Deer Creek sediments to naturally recover to sediment cleanup levels could be years.

Estimated Capital Cost: $2.3 Mil

Estimated Operations and Maintenance Cost: $2.4 Mil

Estimated Total Present Worth Cost: $4.8 Mil

Estimated Construction Time Frame: 1 year

Estimated Time to Achieve RAOs after construction: 2 to 5 years in South Fork of Big Deer Creek and 2 to 3 years or more in Big Deer Creek water quality, 2 to 5 years in South Fork of Big Deer Creek sediments approximately, several years or more in Big Deer Creek sediments.

Alternative BT-6 – Seep Collection and Treatment; Complete Sediment Removal

This alternative has groundwater seep collection and treatment as described under BT3. However, this alternative includes removal of sediments from Bucktail, South Fork Big Deer and Big Deer Creeks to be disposed of on-site. The groundwater seep collection will not intercept all the metals in water. Therefore, elevated levels of copper and cobalt in Bucktail Creek would prevent water quality cleanup levels from being met in South Fork of Big Deer Creek likely for centuries. However, this alternative could result in meeting water quality cleanup levels in Big Deer Creek. Sediment cleanup levels in South Fork of Big Deer Creek and Big Deer Creek would be met through removal. Complete removal of in-stream sediments would destroy existing wildlife riparian habitat, which would take years to a decade or more to re-establish. In addition, this alternative would require much more extensive construction activities and truck traffic than the other alternatives, resulting in greater risks to the community and site workers.

Estimated Capital Cost: $8.4 Mil

Estimated Operations and Maintenance Cost: $3.0 Mil

Estimated Present Worth Cost: $11 Mil

Estimated Construction Time Frame: 3 to 5 years

Estimated Time to Achieve RAOs after construction: centuries in South Fork of Big Deer Creek and 2 to 3 years or more in Big Deer Creek water quality, 1 year for sediments.

Comparative Evaluation of Bucktail Creek Alternatives

Overall Protection of Human Health and the Environment. Alternative BT-5 is the only alternative that could meet water quality and sediment cleanup levels in South Fork Big Deer and Big Deer Creeks within a reasonable time frame. Alternatives BT-3, BT-4 and BT-6 could achieve water quality and sediment cleanup levels in Big Deer Creek in a reasonable time frame. However, these alternatives would not achieve water quality cleanup levels in South Fork Big Deer Creek within a reasonable time frame (likely not for centuries) because of the length of time required for the metals to leach from source materials (impacted water from waste rock above the 7000 dam that will not be intercepted by seep collection). The sediment removals in BT-4 and BT-6 would reduce the time to achieve sediment cleanup levels in South Fork of Big Deer Creek; however there would be the potential for recontamination and this would cause considerable short-term disruption of the stream channels and riparian habitat with no environmental gain to water quality.

Compliance with ARARs. The No-Further Action alternative (BT-1) would not meet the copper ARAR in either South Fork Big Deer or Big Deer Creeks. Alternatives BT-3, BT-4 and BT-6 would meet copper water quality ARARs in Big Deer Creek, but not in South Fork Big Deer Creek. Alternative BT-5 is the only alternative that can meet ARARs in Big Deer Creek and South Fork Big Deer Creek in a reasonable time frame. All of the alternatives may exceed the AWQC for copper in Big Dreek Creek at times which may result in contingent actions in the future.

Long-term Effectiveness and Permanence. Alternative BT-5 is judged to have the best long-term effectiveness because it can meet the water quality and sediment cleanup levels in South Fork of Big Deer and Big Deer Creeks in a reasonable time frame. All of the other action alternatives (BT-3, BT-4, and BT-6) would be essentially equivalent in terms of long-term effectiveness. They would all achieve water quality cleanup levels in Big Deer Creek; however, South Fork of Big Deer Creek water quality cleanup levels would not be met for centuries. The primary difference among Alternatives BT-3, BT-4 and BT-6 is the time to achieve sediment cleanup levels. Alternatives BT-4 and BT-6 would meet sediment cleanup levels in South Fork Big Deer Creek upon completion of remedial actions. However, since not all the groundwater will be intercepted from the seep collection system there is the potential for re-contamination of sediments from Bucktail Creek sediments for BT-4. Alternative BT-3 would require years to a decade or more to achieve sediment cleanup levels in South Fork of Big Deer Creek and Big Deer Creek.

Alternative BT-6 has the lowest level of residual risks because all the sediments would be removed. This would eliminate the potential for metals to leach from the sediments and re-mobilize and deposit downstream during large storm events. All of the action alternatives (BT-3, BT-4, BT-5, and BT-6) would be essentially equivalent in terms of reliability of controls and permanence. As long as the operation and maintenance of these facilities is properly performed, any of the Bucktail Creek action alternatives would provide a permanent remedy.

Reduction of Toxicity, Mobility, and Volume through Treatment. Alternative BT-1 would provide treatment of only waters intercepted as part of the Early Actions. Alternatives BT-3, BT-4, BT-5 and BT-6 would provide the same reduction in toxicity, mobility and volume through treatment of the collected Bucktail Creek groundwater.

Short-term Effectiveness. Alternative BT-1 is rated highest for short-term effectiveness since there would be no short-term impacts to the environment, workers or the community. Alternatives BT-3 and BT-5 are rated next highest for short-term effectiveness and are essentially comparable with BT-3 which has a slight edge because it involves less contruction.

Both alternatives would have minimal risks to the community, acceptable construction risks, minimal unavoidable short-term environmental risks, and could be implemented within 2 years. Alternative BT-4 is rated lower than Alternatives BT-3 and BT-5 because the sediment removal in South Fork Big Deer Creek would result in greater construction risks and considerable disruption of the stream channel and riparian habitat. Alternative BT-6 is rated lowest because the extensive sediment removal could result in greater construction risks, and extensive disruption of stream channels and riparian habitat, and a much longer construction period.

Implementability. Alternatives BT-3 and BT-5 are essentially comparable since both alternatives would utilize standard construction techniques. Alternative BT-4 is rated lower due to the need for stream diversion, dewatering and sediment control during the sediment removal. Alternative BT-6 is rated lowest because of the need for stream diversion, dewatering and sediment control during the sediment removal, the need to site, design and maintain an on-site repository, and the uncertainty of approval for construction of an access road along Big Deer Creek. All of the alternatives are rated comparable in terms of implementing institutional controls on lands administered by the Forest Service.

Cost. Alternative BT-3 is the least costly; however, this alternative will not achieve sediment cleanup levels and the copper ARAR in South Fork of Big Deer in a reasonable time frame. Alternative BT-5 costs approximaely $300,000 more than BT-3 and would meet water quality cleanup levels and ARARs in both South Fork Big Deer Creek and Big Deer Creek. The other action alternatives (BT-4 and BT-6) would be considerably more costly.

State Acceptance. The State of Idaho has been involved in the development of the Remedial Investigation and Feasibility Study that supports this Proposed Plan. EPA is providing the State of Idaho with an opportunity to comment on the Proposed Plan.

Community Acceptance. Comments received on the Proposed Plan are an important indicator of community acceptance. Community acceptance of the Preferred Alternative will be evaluated after the public comment period ends and will be described in the Record of Decision.

Panther Creek Drainage Alternatives

Common Element for Panther Creek Alternatives:

Institutional controls (ICs) will be required for all alternatives except where contaminated materials are removed to cleanup levels. ICs are administrative measures such as easements, restrictive covenants and enforcement tools that are used to provide notice to current and future land owners of remaining contamination on the property, to limit the use of the property, and to restrict residential or other activities that could result in unacceptable exposure to remaining contamination.

Improved water quality in Panther Creek is dependent on the alternatives selected for Blackbird and Bucktail Creeks.

Alternative P-1 – No Further Action

Under this alternative, no action would be taken for those properties where a potential risk is shown for a future residential use. Arsenic concentrations exceed the future residential human health cleanup level in some overbank areas along Panther Creek. Currently, these areas do not pose a potential risk based on frequency of exposure to the areas. However, there is a potential for changes in future land use that could increase frequency of exposure.

Estimated Capital Cost: $0
Estimated Annual Operations and Maintenance Cost: $0
Estimated Present Worth Cost: $0
Estimated Construction Time Frame: None
Estimated Time to Achieve RAOs: Will not achieve RAOs.

Alternative P-2 – Institutional Controls with Natural Recovery of Panther Creek Sediments

Under this alternative, institutional controls would be used for private property along Panther Creek where arsenic concentrations in soil exceed potential future residential cleanup levels. Institutional controls would be used at the Rogers, Rufe, former Strawn and Hade (if necessary) properties where arsenic concentrations in overbank areas exceed the cleanup level. The institutional controls would be tied to the property controls, such as conservation easements that would exclude residential development and use in the vicinity of the overbank deposits on the three properties. The institutional controls would restrict land use thereby reducing human exposure above acceptable risk based levels. Obtaining acceptance by private property owners and the easement grantee are necessary for this alternative. In-stream sediments are expected to improve through natural recovery such that sediment cleanup levels would eventually be achieved in Panther Creek (in several years or more).

At some of the private properties where overbank soil was removed as part of the Early Actions, elevated concentrations of arsenic remain beneath the clean backfill at the water table. Institutional controls may be needed to address activities that might result in exposure to the contaminated subsurface soils in the water table.

Estimated Capital Cost: $0.1 Mil
Estimated Operations and Maintenance Cost: $0.1 Mil
Estimated Total Present Worth Cost: $0.2 Mil
Estimated Construction Time Frame: 1 to 2 years to implement enforceable ICs
Estimated Time to Achieve RAOs: Upon implementaion of ICs, Panther Creek sediments in several years or more.

Alternative P-3 – Selective Overbank Deposit Removal; Natural Recovery of In-Stream Sediments

Under this alternative, selected overbank deposits with arsenic concentrations in soil above the cleanup level would be removed at the Rogers, Rufe, former Strawn and Hade (if necessary) properties along Panther Creek. The removal of overbank deposits above the residential arsenic cleanup level would eliminate the potential future risks associated with those deposits and avoid the need for institutional controls. Monitoring would also be conducted following significant storm events to ensure that downstream properties were not recontaminated due to remobilization of sediments from Blackbird Creek. Instream sediments are expected to improve through natural recovery such that sediment cleanup levels would eventually be achieved in Panther Creek (in several years or more). Institutional controls may be needed to address activities that might result in exposure to the contaminated subsurface soils in the water table.

Estimated Capital Cost: $1.4 Mil
Estimated Annual Operations and Maintenance Cost: $0
Estimated Present Worth Cost: $1.4 Mil
Estimated Construction Time Frame: 1 year
Estimated Time to Achieve RAOs: Upon completion of construction

Comparative Evaluation of Panther Creek Alternatives

Overall Protection of Human Health and the Environment. Water quality standards in Panther Creek will be achieved by selection of suitable alternatives for Blackbird and Bucktail Creeks. Sediment quality in Panther Creek would improve through natural recovery such that sediment cleanup levels would eventually be achieved in Panther Creek. Meeting sediment cleanup levels in Panther Creek is not as time-critical for improvement of aquatic habitat quality as is meeting the surface water cleanup levels in Panther Creek. The reason is that most of the current measured sediment concentrations are below known probable toxic levels, thus benthic communities in Panther Creek should not exhibit high levels of impact due to sediment exposure. Salmonids are not expected to be directly impacted by sediment concentrations, and the food supply for salmonids provided by the benthic community

should improve with improving water quality in Panther Creek despite the current exceedances of the sediment cleanup levels.

The evaluation of overall protectiveness for the Panther Creek alternatives is focused on human health. Under current land use, overbank deposits do not pose an unacceptable risk to human health. However, if land use changes so that the frequency of exposure increases, there could be a potential risk in the future.

Alternative P-1 does not provide monitoring or institutional controls of any future changes in land use. Therefore, under Alternative P-1, changes in future land use could result in unacceptable human health risks due to exposure to arsenic. Alternatives P-2 and P-3 both address potential future land use. Removal (P-3) is generally considered more reliable and permanent than monitoring and institutional controls which, if not properly enforced, could lead to human exposure to contaminants.

Alternative P-1 is not protective of human health. Alternative P-2 would be protective of human health as long as enforceable institutional controls can be implemented and properly maintained. Alternative P-3 would be protective of human health.

Compliance with ARARs. All of the alternatives for Panther Creek would comply with ARARs.

Long-Term Effectiveness and Permanence. Alternatives P-2 and P-3 both address potential future land use. Removal (P-3) is generally considered more reliable and permanent than institutional controls which, if not properly enforced, could lead to unacceptable human health risks due to exposure to contaminants.

Reduction in Toxicity, Mobility and Volume through Treatment. Since none of the Panther Creek alternatives involve treatment, there is no difference among these alternatives for this criterion.

Short-Term Effectiveness. Alternative P-3 may take longer to implement than Alternative P-2, depending on the time to implement enforceable institutional controls. Removal would create short-term risks to the community and site workers due to truck traffic and excavation equipment, and short-term disruption of ecological habitat. Alternative P-3 would require 1 to 2 years to implement.

Implementability. Alternative P-2 requires a long-term monitoring program and institutional controls. Administratively, this alternative would be the most difficult to implement of the Panther Creek Alternatives because it depends upon the acceptance of land use restrictions by the property owners, and acceptance by an independent third party as grantee of the land restriction easements. Alternative P-3 would be more difficult to physically implement than Alternative P-2 because of the effort involved in removing overbank deposits.

Cost. The estimated cost for Alternative P-2 is lower than for Alternative P-3, although there is some uncertainty in the costs of implementing and monitoring institutional controls.

State Acceptance. The State of Idaho has been involved in the development of the Remedial Investigation and Feasibility Study that supports this Proposed Plan. EPA is providing the State of Idaho with an opportunity to comment on the Proposed Plan.

Community Acceptance. Comments received on the Proposed Plan are an important indicator of community acceptance. Community acceptance of the Preferred Alternative will be evaluated after the public comment period ends and will be described in the Record of Decision.

Preferred Alternative

Blackbird Creek Drainage Area

The Preferred Alternative is BB-7, Meadow Creek Seep Collection; Cover West Fork Tailings Impoundment and Treat Tailings Impoundment Seepage; Removal with Selective Stabilization of Overbank Deposits; Natural Recovery for In-Stream Sediments. (*See Figure 2.*)

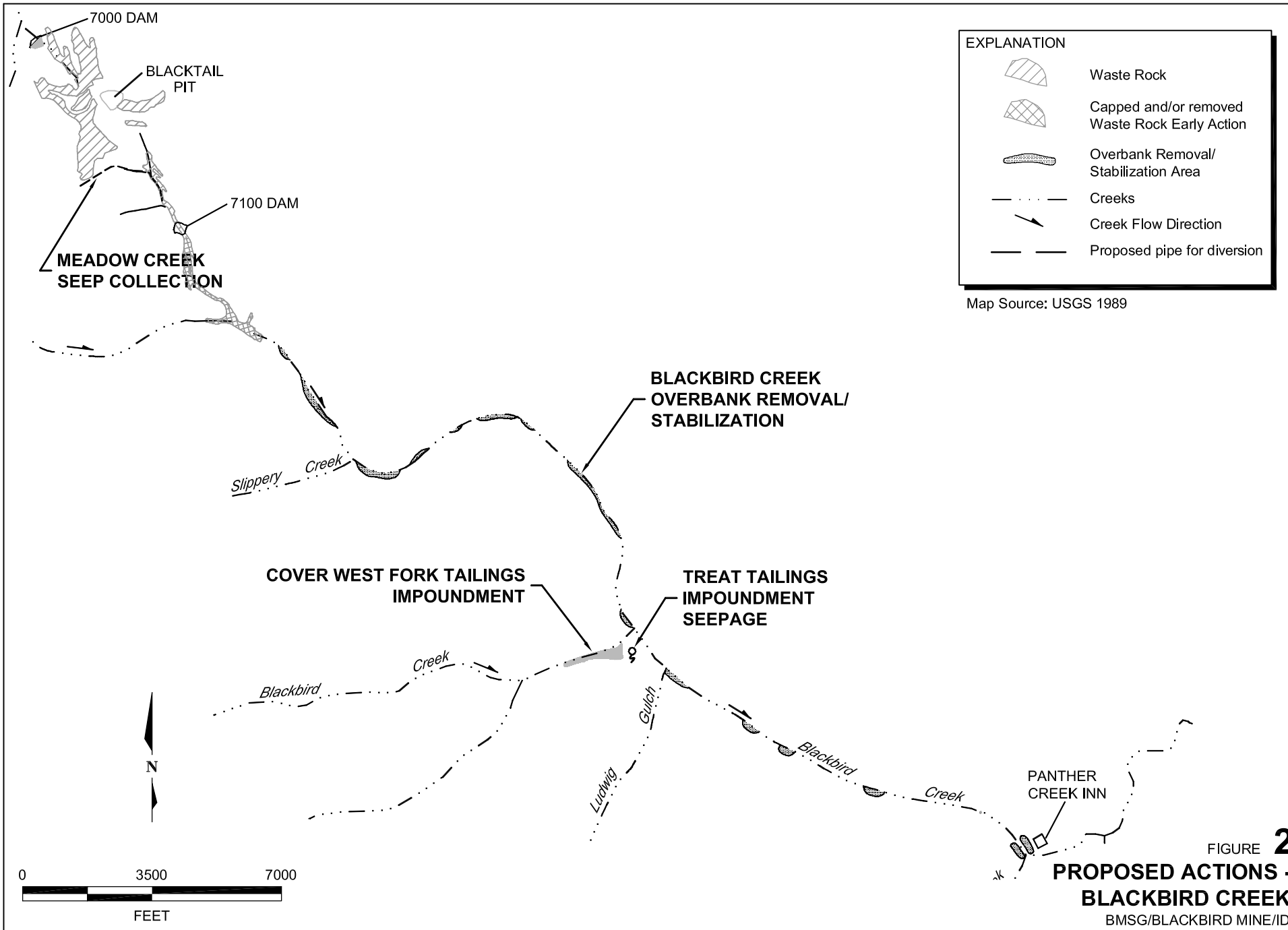

FIGURE **2**

PROPOSED ACTIONS - BLACKBIRD CREEK

BMSG/BLACKBIRD MINE/ID

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Golder Associates

In this alternative, Meadow Creek seep collection would be used to address seeps in upper Meadow Creek that have not yet been intercepted by the Early Actions and are therefore contributing contaminants to Blackbird and Panther Creeks. These seeps were originally planned to be addressed as part of the Early Actions. The Meadow creek seep collection component of BB-7 may therefore be performed as a modification to the Early Action or as part of the remedial action selected in the ROD. The decision as to whether the seep collection will be performed as an Early Action or as a remedial action is driven by the need to implement this action this year. The seeps would be collected, and diverted to the 7100 dam for storage and then to the existing wastewater treatment plant for treatment and discharge. Collection and treatment of the Meadow Creek seeps would improve the water quality in Blackbird Creek and Panther Creek.

A vegetated soil cover would be used to close the West Fork Tailings Impoundment. This cover would prevent direct contact with the tailings and prevent surface water transport of the tailings. The vegetated cover would also reduce infiltration, thereby reducing contaminant migration into Blackbird Creek. Grading and other surface water controls to address stormwater runoff would further reduce infiltration and the volume of seepage discharging into Blackbird Creek.

Groundwater affected by the Tailings Impoundment would be intercepted and treated. The treatment would result in a decrease in downstream cobalt concentrations in Blackbird and Panther Creeks, and some reduction in copper concentrations. Treatment could be accomplished either by collecting and pumping back to the existing Wastewater Treatment Plant, constructing a small active treatment plant at the impoundment or by constructing an *in-situ* passive treatment system.

In selecting this alternative, EPA may consider a staged implementation which would allow for further cobalt toxicity analysis and biological testing to determine if another cleanup level for cobalt is protective before requiring treatment of groundwater affected by the Tailings Impoundment. This staged implementation would be scheduled so that the acceptable cobalt levels are achieved at the same time that acceptable copper levels are achieved. Through this approach, EPA could determine that another cobalt cleanup level is protective or that cobalt levels have decreased sufficiently in Panther Creek so that treatment of the groundwater at the Tailings Impoundment would not be necessary.

Overbank deposits would be addressed primarily by removal from key areas. In addition, a lesser quantity of overbank deposits would be physically stabilized by armoring with rock where removal is not considered practical. Overbank and in-stream deposits along Blackbird Creek adjacent to the PCI would be addressed through removal and monitoring. If overbank or in-stream sediments adjacent to the PCI become re-contaminated in the future, they would be addressed through additional removal of material. Removed material would be disposed at the West Fork Tailings Impoundment, 7400 waste rock dump, or the Blacktail Pit.

In-stream sediments in Blackbird Creek would be addressed through natural recovery.

Institutional controls would be used to minimize potential exposure to affected soil, and to prevent activities or development that would compromise the integrity of the remedy (*e.g.*, the Tailings Impoundment cover). Monitoring would determine the effectiveness of the remedy.

This alternative is recommended because it will achieve substantial risk reduction by treating the contaminated water, by removing a large degree of the mobile contaminated material along Blackbird Creek and providing safe management of remaining material. This alternative provides the most certainty that cobalt cleanup levels will be achieved in a reasonable time period in Panther Creek by

treating contaminated water coming from the West Fork Tailings Impoundment. This alternative also provides the most certainty that ARARs and the water cleanup level for copper will be achieved in Panther Creek. It is expected that water quality cleanup levels will be achieved in Panther Creek within 1 to 2 years after construction is complete.

Alternative BB-7 is expected to achieve the modified cleanup goal for Blackbird Creek to improve water and sediment quality such that cleanup levels are not exceeded down-stream in Panther Creek. In addition, Alternative BB-7 will improve water quality in Blackbird Creek such that EPA's narrative goals will be met.

Bucktail Creek Drainage Area

The Preferred Alternative is BT-5, Seep Collection and Treatment; Diversion of Bucktail Creek; Natural Recovery of Sediments. *(See Figure 3, page 28).*

In this alternative, contaminated groundwater seepage below the 7000 dam that has not yet been intercepted by the Early Actions would be intercepted in a french drain and pumped back to the 6930 adit, then routed to the existing Wastewater Treatment Plant for treatment and discharge. Depending on the results of treatability studies, the groundwater would be treated at a passive *in-situ* facility (*i.e.*, a sorption wall). Seepage collection would be performed initially below the 7000 dam but above the existing Bucktail Creek pump-back station. These seeps were originally planned to be addressed as part of the Early Actions. This seep collection component of BT-5 may therefore be performed as a modification to the Early Action or as part of the remedial action selected in ROD. The decision as to whether the seep collection will be performed as an Early Action or as a remedial action is driven by the need to implement this component of the action this year.

After construction of the initial seepage collection with the french drain, additional seepage collection would be implemented downstream (unless it is determined unnecessary after the french drain system is constructed). The additional seepage collection would be constructed downstream with a subsurface barrier. Depending on the amount of flow and copper concentrations, the seepage would either be pumped-back to the existing treament plant, or *in-situ* treatment (*e.g.*, apatite adsorption bed). The treatment would result in a decrease in downstream copper and cobalt concentrations in Bucktail Creek, South Fork Big Deer Creek and Big Deer Creek.

The groundwater seep collection system will not be able to intercept all the groundwater containing metals. Therefore, the predicted concentrations of metals remaining in Bucktail Creek below the groundwater seep collection system will still be high enough to prevent South Fork of Big Deer water quality goals from being met. Therefore, Bucktail Creek would be diverted in a pipeline or ditch to bypass South Fork of Big Deer Creek and discharge directly into Big Deer Creek. If a diversion pipeline is used, it would be equipped with a diffuser where it discharges to Big Deer Creek. This diversion would divert the metals remaining in Bucktail Creek, below the seep collection system around the short segment of South Fork of Big Deer Creek downstream of Bucktail Creek. Water quality goals and the copper ARAR in the South Fork of Big Deer Creek could then be achieved. Concentrations of copper in Bucktail Creek water are not expected to cause water quality exceedances in Big Deer Creek water after mixing. Under this approach, Big Deer Creek could continue to meet water quality goals and the copper ARAR.

Stream sediments would be cleaned up by natural recovery. Metals leaching from sediments in Bucktail Creek could continue to affect downstream surface water quality in Big Deer Creek. It's difficult to predict the time

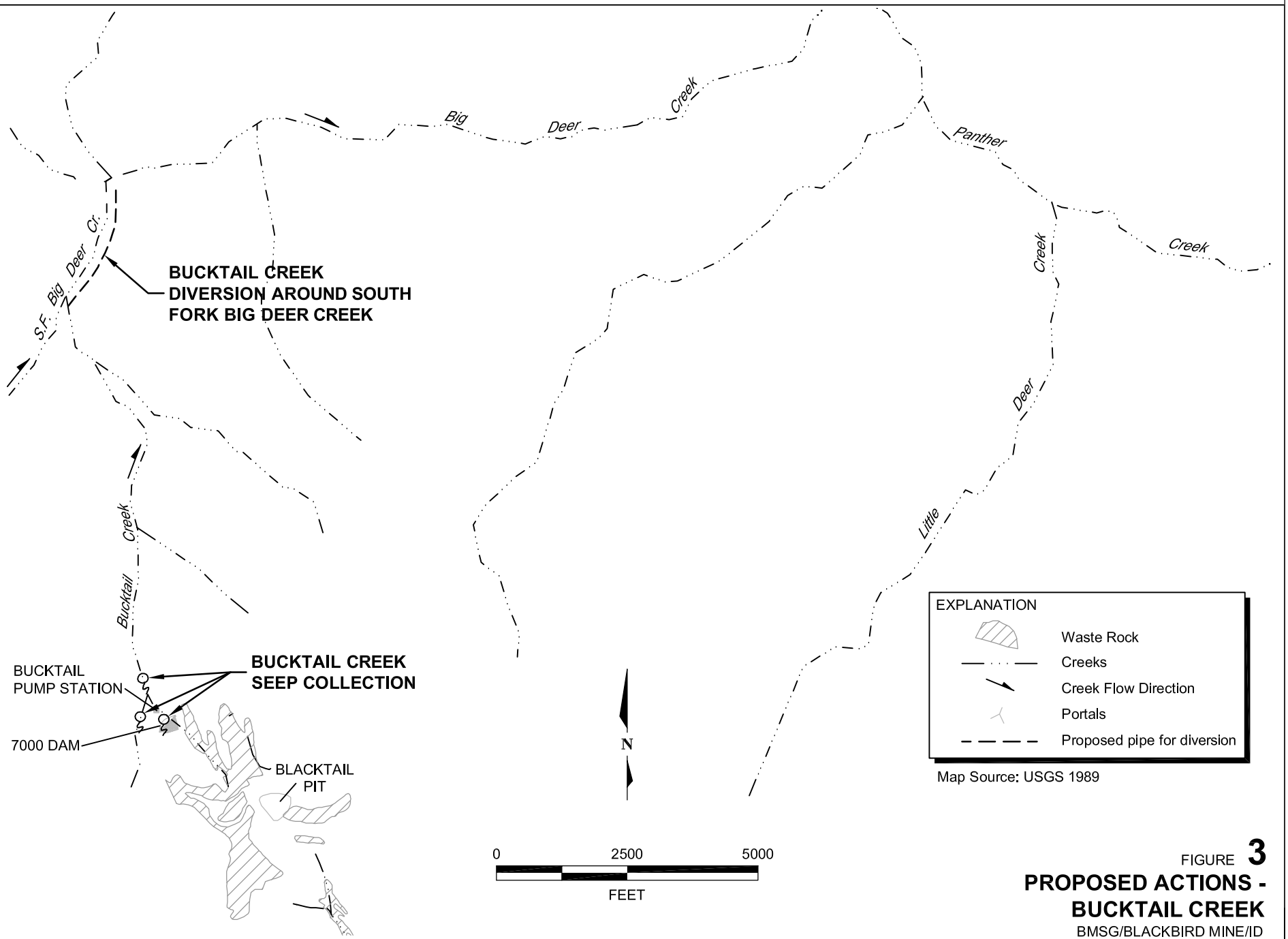


FIGURE **3**

PROPOSED ACTIONS - BUCKTAIL CREEK

BMSG/BLACKBIRD MINE/ID

required until the Bucktail Creek sediments would no longer impact downstream water quality, but it is likely to be years to a decade or more. In addition, collection of Bucktail Creek seepage may not be as effective as assumed. If post-remediation monitoring indicates that downstream water quality goals in Big Deer Creek will not be met for an unacceptable period, contingency alternatives would be evaluated and implemented.

The Bucktail Creek diversion would limit metals migration to South Fork of Big Dear Creek. The time for sediments to naturally recover should be shortened, such that sediment cleanup levels would likely be met in South Fork of Big Deer Creek more rapidly (estimated to be 2 to 5 years). The amount of time it would take for Big Deer Creek sediments to naturally recover to sediment cleanup levels could be a few to many years. Meeting sediment cleanup levels in Big Deer Creek is not as time-critical for improvement of aquatic habitat quality as is meeting surface water cleanup levels. The reason is benthic communities in Big Deer Creek should not show high levels of impact due to sediment exposure. Salmonids are not expected to be directly impacted by sediment concentrations, and the food supply for salmonids provided by the benthic community should improve with improving water quality in Big Deer Creek despite the current exceedances of the sediment cleanup levels.

ICs similar to those implemented as part of the BB-7 would apply to BT-5. Monitoring would be performed to determine the effectiveness of the remedy.

This alternative is recommended because it will achieve substantial risk reduction by both treating contaminated water and providing safe management of remaining material. This alternative could achieve water quality cleanup levels and meet the copper ARAR in both Big Deer and South Fork of Big Deer Creeks in a reasonable time frame for an additional cost of approximately $300,000 compared to Alternative BT-3.

Contingent Actions for Blackbird Creek and Bucktail Creek Drainage Area

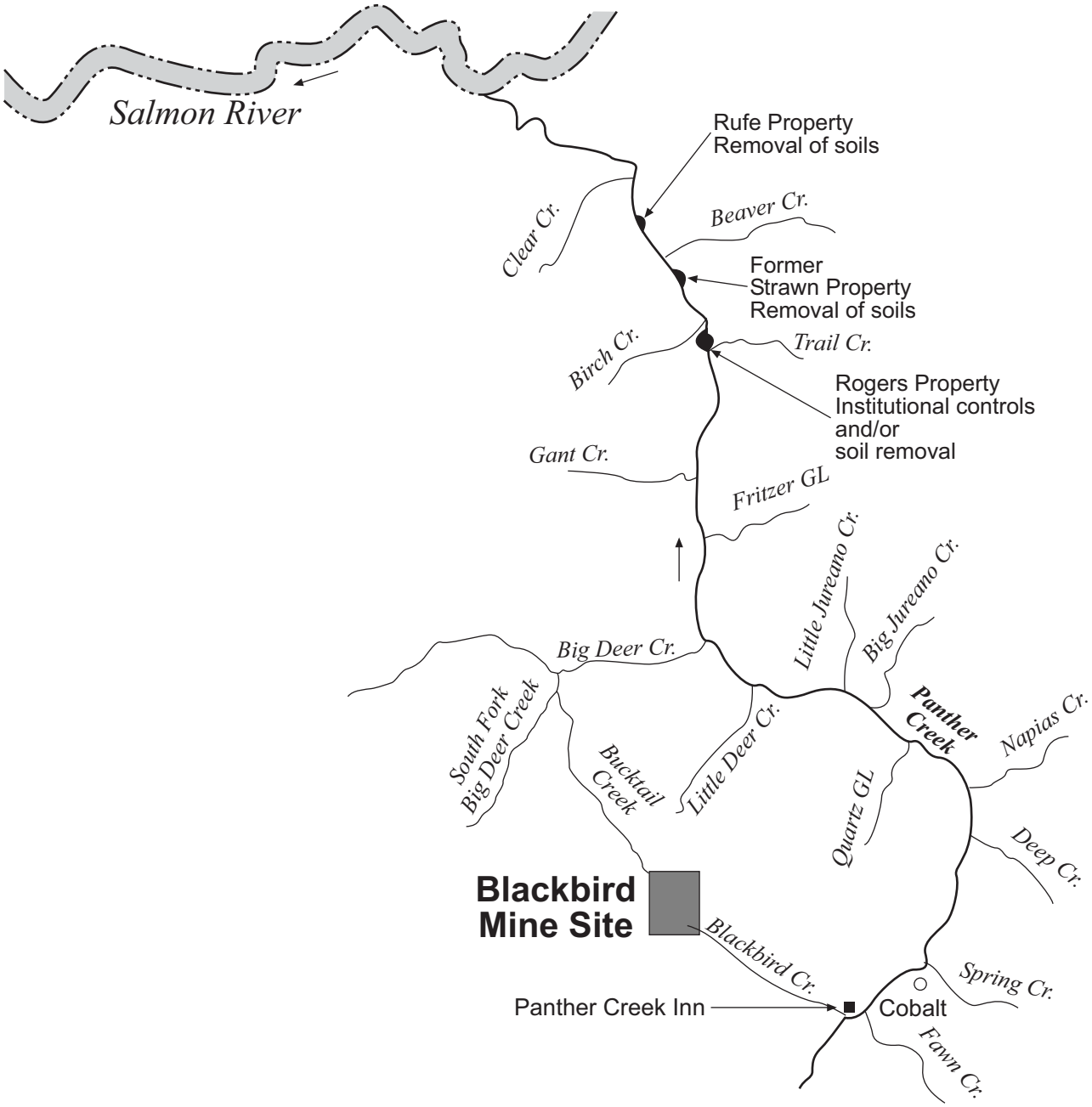
There is uncertainty whether some of the components of the proposed remedial action will be effective in meeting the RAOs and cleanup levels. Therefore, for some areas of the site, monitoring and evaluations are needed after construction of the preferred remedial alternative. Based on the monitoring results and further evaluations, additional actions may be necessary in the future if RAOs are not met. See the Feasibility Study for more information on the types of contingent actions that may be considered in the future.

Panther Creek Drainage Area

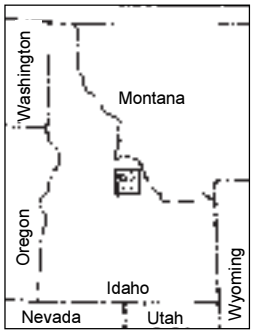
The Preferred Alternative is a combination of Alternatives P-2 and P-3. Several isolated areas exist where arsenic-contaminated soil has been deposited along lower Panther Creek that was not cleaned up as part of the Early Actions at the Site. Early Actions were taken only at areas that posed a risk under a current use situation. However, some areas could have increased use in the future and/or could be developed for residential use in the future posing a potential risk. *(See Figure 4, page 30)*.

Overbank deposits above the cleanup level will be removed at the Rufe and former Strawn properties. Soil will be removed to meet the human health cleanup level for potential future residential use (100 mg/kg arsenic). Removal of soil would eliminate the need for institutional controls at these properties. To protect the remedy at these properties, monitoring will be conducted following significant runoff events to ensure that these properties do not become recontaminated due to remobilization of upstream sediments (particularly Blackbird Creek sediments).

At some or all of the arsenic overbank deposit areas at the Rogers and Hade (if necessary) properties, institutional controls may be utilized to protect human health under the future residential scenario. These institutional controls



KEY MAP



N

Not to Scale

FIGURE **4**
PROPOSED ACTIONS
PANTHER CREEK
BMSG/BLACKBIRD MINE SITE/ID

DRAWING NO. 94315950039200fg04.fh9 DATE 07/25/02 DRAWN BY EL

Golder Associates

could include land use restrictions to preclude future residential use of this property. Proprietary controls, such as a conservation easement, would be established on all or portions of the contaminated overbank deposits at this property. In addition, information (ex. fact sheets) would be provided to the property owners. The grantee of the easement would be a third party, preferably a government entity, that would ensure that the land is not developed for residential use in the future.

If the current property owner is not willing to grant the easement, or if an appropriate third party is not identified that is willing to accept the easement, institutional controls would not be implemented at the Rogers property. If this happens, removal of contaminated materials would be conducted.

This alternative is recommended because it will achieve substantial risk reduction by removing some of the source materials and providing safe management of remaining material through institutional controls. The cost of combined P-2/ P-3 Alternative is $300,000 total present worth ($200,000 capital and $100,000 for operations and maintenance).

Based on the available information, EPA believes the Preferred Alternative for the three drainage areas meets the threshold criteria of being protective of human health and the environment and compliance with ARARs. This alternative provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria.

Administrative Record

The Administrative Record containing documents from the investigation and cleanup of the Site is available for your review at the following:

Salmon Public Library
204 Main Street
Salmon, ID

U.S EPA – Idaho Operations Office
1435 North Orchard Street
Boise, ID

U.S EPA – Region 10
1200 Sixth Avenue
Records Center - 7th Floor
Seattle, WA

The Proposed Plan and a few of the major reports are also available at the Panther Creek Inn, Cobalt, Idaho.